CHAPTER 6

SEWER

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6.1 General Information

6.1.1 Purpose

This section provides guidance and minimum design criteria for the modification and construction of wastewater collection and treatment systems constructed within City public rights-of-way or easements. It is intended for general use in the planning, design, and plan preparation processes.

6.1.2 Abbreviations

- A. ADEQ Arizona Department of Environmental Quality
- B. ADHS Arizona Department of Health Services
- C. ANSI American National Standards Institute
- D. ARS Arizona Revised Statutes
- E. ASTM American Society for Testing and Materials
- F. AWWA American Water Works Association
- G. DIP Ductile Iron Pipe
- H. EPA Environmental Protection Agency
- I. gpcd gallons per capita per day
- J. gpd gallons per day
- K. gpm gallons per minute
- L. POTW Publicly Owned Treatment Work
- M. PUE Public Utility Easement
- N. PVC Polyvinyl Chloride
- O. MAG Maricopa Association of Governments
- P. VCP Vitrified Clay Pipe

6.1.3 Ordinance Requirements

- A. The City requires sewer lines to be installed along the entire length of property line frontage of the property to be developed whenever future extension of the line is possible. The property line frontage is that portion of the property along a public right-of-way. If a parcel to be developed has more than one property line frontage, the City will require a sewer line to be installed along all frontages.
- B. Upon development of property for which City water or sewer service is available, the developer shall submit a plan for the sewer system prepared by a professional engineer licensed in the State of Arizona.
- C. The Developer shall install, at his expense, all onsite and offsite improvements necessary to serve the development. This includes payment of all required development fees.

- D. The City may require users who have a non-residential discharge to monitor their discharges and obtain an Industrial Waste Discharge Permit. The permit may be obtained from the City's Community Development Counter.
- E. For more specific information on ordinance requirements, review of the Goodyear Revised Code is recommended.

6.1.4 City Policies

- A. Sanitary sewers shall be designed to serve the ultimate population density expected in the tributary area. The design must be in conformance with the current City-approved <u>Wastewater Master Plan</u>; and, as such, shall take future connections into consideration.
- B. Sewer lines shall not be privately owned if future connection to said sewer lines will be necessary to serve adjacent parcels.
- C. Private sewer lines shall meet Maricopa County Health Department and City Building Inspection requirement for approval. Privately owned and maintained sewer lines shall not be located within the street right-of-way or a PUE. Onsite sewer collection systems within commercial shopping centers shall be designed as private systems.

D. Private Sewer Companies

- 1. Portions of Goodyear's municipal service area are provided sewer service by private sewer companies. Private companies are those defined by ARS.
- 2. Modifications or construction of sewage collection systems within private sewer company franchise areas shall be reviewed by the City and the subject company. The City shall also review private sewer systems within the City limits. Private sewer systems within the City shall meet current City standards. The applicable review fees shall be paid and a note placed on the drawings delineating operation and maintenance responsibilities. The City cannot provide sewer service within private sewer company franchise areas.

E. EPA Regulation

The City is required by the US EPA to develop and implement a program to control discharges that might harm the POTW. The program establishes local discharge limits for non-residential users and provides for a permitting process based on user discharges and business types. Details of the program and requirements are found in

the Goodyear Code of Ordinances. Specific information may be obtained by calling the Water Resources Department at 623-932-3010.

6.1.5 Sewer System

- A. All developments are required to connect to the City's sewer system. Onsite disposal systems are not allowed. Exceptions are made only with the written approval of the City Engineer.
- B. The City's sewer system includes 6 classifications of sewer lines which are determined by use. These classifications are:
 - 1. Service Line In plumbing, the extension from the building drain to the public sewer or other place of disposal; also called house connection.
 - 2. Branch Sewer A sewer that receives wastewater from a relatively small area and discharges into a main sewer serving more than one branch sewer area.
 - 3. Lateral Sewer A sewer that discharges into a branch or other sewer and has no other common sewer tributary to it.
 - 4. Submain Sewer A sewer which the wastewater from two or more lateral sewers is discharged and which subsequently discharges into a main, a trunk, or other collector.
 - 5. Main Sewer/Trunk Sewer In larger systems, the principal sewer to which branch sewers and submains are tributary. In small systems, a sewer to which one or more branch sewers are tributary. In plumbing, the public sewer to which the house or building sewer is connected.
 - 6. Interceptor Sewer A sewer that receives flow from a number of transverse sewers or outlets, and conducts such waste waters to a point for treatment or disposal.
- C. All developments shall provide for trunk, main, and service lines as required to provide sewer service for not only the individual development but for the ultimate service area, as deemed necessary by the City Engineer.
- D. Sewer lines shall be sized to accommodate their ultimate service area. The minimum size line for the public mains is 8-inch diameter.

- E. Public sewage lift stations shall not be permitted in the City of Goodyear. Under unusual circumstances when a lift station is the only means of the property being sewered or for temporary applications, consideration shall be given by the Water Resources Director, or his designee, on a case by case basis.
- F. A sewerage feasibility report, prepared by a registered civil engineer, shall be required to determine that the current line has the capacity for connection and that the minimum slopes will allow for the installation of services. The cost of said report shall be the responsibility of the Developer.
- G. All sewers shall be a minimum of 8-inch diameter. Larger mains may be required dependent upon the maximum flows anticipated with full development of the ultimate service area. The following data may be used as a general guide for planning purposes.

 Additional engineering studies may be required in individual cases to verify validity of these general capacities:
 - 1. A maximum of 120-acres of combined commercial and residential property may drain into any 8-inch line.
 - 2. A maximum of 250-acres of combined commercial and residential property may drain into any 10-inch line.
 - 3. A maximum of one square mile may drain into a 12-inch line with the written approval of the City Engineer.
- H. ADHS Bulletin 11 shall apply to all City sewer lines.

6.2 Technical Design Requirements

6.2.1 Sewer Lines

A. Materials and Details

In selecting pipe material for sewers, consideration shall be given to the chemical characteristics of the wastewater, especially in industrial waste flow areas, the possibility of septicity, exclusion of infiltration, external and internal pressures, abrasion, and similar problems encountered with the established grades.

1. Approved plastic or VCP may be used for main lines and service lines, between 4 and 15-inches. DIP and VCP may be used for 15 to 24-inch sewer lines in the rights-of-way. Materials and details for trunk sewer mains of 24-inch diameter or larger will be reviewed on a case-by-case basis.

- 2. No public sewers other than service lines shall be less than 8-inches in diameter unless permission is received in writing from the City Engineering Department.
- 3. Pipe material shall not change between manholes.
- 4. Where standard strength pipe is not structurally sufficient, or when proper cover cannot be maintained, additional strength must be obtained by using extra-strength pipe, special bedding specifications, and / or special construction methods.
- 5. All types of pipe materials used in design shall have established ASTM, ANSI, or NSF standards of manufacture or seals of approval and shall be designated for use as sewer pipe.
- 6. Pavement replacement type and compaction type shall be indicated per City Standard Details, and shall be identified on each sheet.

B. Hydraulic Design

- 1. Slopes shall be sufficient to maintain velocity of 2 fps in the sewer, based upon Manning's Formula, using an "n" value of 0.013. To prevent abrasion and erosion of the pipe material, the maximum velocity shall not exceed 9 fps.
- 2. Hydrogen sulfide problems must be analyzed in the Design Report and be provided for in the design of the system where required.
- 3. All velocities should be analyzed under peak flow conditions.
- 4. The following table indicates the minimum and maximum slopes generally considered necessary to obtain velocities between 2 fps and 9 fps. Exceptions require the written approval of the City Engineer.

TABLE 6.2-1 Slopes for Sanitary Sewers (n = 0.013)

Pipe Size (inches)	Minimum Slope 2.0-fps (ft/ft)	Maximum Slope 9.0-fps (ft/ft)
4	0.0084	0.1703
6	0.0049	0.0992
8	0.0033	0.0676
10	0.0025	0.0502
12	0.0019	0.0394
15	0.0014	0.0292
5. 18	0.0011	0.0229
24	0.00077	0.0156

C. Location within the Right-of-Way

- 1. All public sanitary sewer lines shall be located within a dedicated street right-of way.
- 2. Sewer lines shall be located per City Standard Details.
- 3. Sewer line shall not cross street centerline.
- 4. Centerline of the sewer line shall not be closer than 5-feet to the lip of gutter.
- 5. Center of manhole must be at least 3-feet from the street centerline.
- 6. All sewer lines shall be aligned parallel to the property lines or the street centerlines or as close to parallel as possible.
- 7. Minimum horizontal distance from the sewer line to another underground utility shall be 6-feet.

D. Easement Requirements

- No sewer lines shall be installed in an easement unless the Water Resources Director has approved in writing the placement of the line(s) in an easement(s) and the property owner has granted the necessary easement(s) and right(s)-ofway.
- 2. If approved, sewer lines outside of public rights-of-way shall be placed in easements not less than 20-feet wide, or at the discretion of the Water Resources Director, or his designee.

 The sewer lines shall be accessible from a public right-of-way.
- 3. Easements larger than 20-feet in width may be required if other utilities are also located in the easement or if additional area is needed for maintenance equipment access due to the size and/or depth of the line(s). Easements shall be free of obstructions, shall not be located in a fenced area, and shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Areas in question shall be approved in writing by the Water Resources Director.
- 4. Easements shall be dedicated prior to any construction.

E. Pipe Locations and Separations

1. Service Lateral Locations

Service lines shall not be located under driveways or driveway wings with the following exceptions:

- a. A service line may be located beneath a driveway wing of a residential lot, if the narrowness of the lot does not permit an alternative location.
- b. The engineering plans shall contain this statement "If a sewer service falls under a driveway during the construction of a home it shall be relocated or a MAG 441 cleanout installed at the PUE line at the City's discretion".

2. Separation of Water and Sewer Lines

Caution should be taken in the design and construction of sewer lines to protect all water supplies from wastewater contamination. To minimize the potential of contamination, the engineer shall design the horizontal and vertical separation of water and sewer lines in accordance with MAG Standard Specifications and City Standard Details.

3. Separation from Gas Lines

The minimum horizontal distance from a sewer line to a gas line shall be 6-feet wall to wall.

4. Separation from Storm Drains and Culverts

- a. Sewer lines crossing less than 2-feet below a storm drain or culvert, or under large structures such as box culverts and bridges may require additional protection such as the use of DIP.
- b. Sewers crossing over storm drains and culverts must be a minimum of 1-foot above.

F. Cover and Depth

- 1. All Service Lines shall have a minimum 4-foot cover measured from finished ground at the property line or easement line. In no case shall sewer lines be installed with less than 4-feet of cover over the top of the pipe (See City Standard Details).
- 2. All trunks, mains, or branches shall have a sufficient depth to serve the ultimate drainage area with a minimum cover of 6-feet.
- 3. When a sewer line crosses an irrigation ditch, at least 4-foot cover between the flow line of the ditch and the crown of the sewer shall be maintained. If this condition cannot be met, the crossing shall be made according to the directions of the City Engineer.
- 4. Where cover is less than 3-feet (due to topography such as canals, washes, etc.), a 6-inch thick concrete cap shall be constructed in-place over the sewer line. This cap shall extend not less than 2-feet on either side of the sewer pipe and shall extend not less than 5-feet beyond the limits of the canal, wash, etc. This is allowed only with the written approval of the City Engineer.
- 5. Sewers shall be installed at a depth sufficient to ensure gravity drainage of wastes from each service. Sewer design shall ensure adequate drainage from the ultimate drainage area, and

shall allow for the future extension of service to adjacent parcels.

6. All sewers shall be designed to absorb superimposed live loads and backfill overburden without damage to the pipe material, and without adversely affecting the hydraulic characteristics of the pipe. The engineer shall specify minimum depths of cover to be provided during the construction of roadways or other facilities affecting cover over the sewer line.

G. Intersecting Lines

- 1. When the size of pipe changes, the crowns shall match.
- 2. Manholes with the through line having a change of direction of more than 30-degrees shall have a minimum 0.10-foot drop through the manhole.
- 3. Manholes with a line intersecting the through line: the intersection line invert shall be 0.10-foot above the flow line of the through line. The lines shall intersect at no more than a 90-degree angle.

H. Curved Sewers

Horizontal curvilinear sewers will not be accepted.

I. Tie-in to Existing System

Construction plans shall call for the contractor to tie-in new work to the existing, active system only after completion of the new work and specific approval of the engineering inspector to make the tie-in.

J. Design Flows

In the absence of flow data provided by the designer, new domestic sewage systems shall be designed in accordance with the following:

- 1. Sewer lines 8 to 12-inches in diameter shall be designed with peak capacities, when flowing full, of not less than 400-gpcd.
- 2. Sewer mains larger than 12-inches in diameter shall be designed using 105-gpcd and a peaking factor developed from "Harmon's Formula":
 - a. Qmax = Qavg $[1 + 14/(4+P^{1/2})]$ WHERE: P = Population (Density * # of Units)/1,000

- b. Commercial flows should be based upon known regional data, or accepted engineering reference sources, approved by the City Engineer.
- c. Density data to be used in sewer design*:
 - (1). Single family units 2.5 persons/unit
 - (2). Multi-family units:
 - ◆ Townhouse/patio homes 2.9 persons/unit
 - ◆ Apartment2.5 persons/unit

6.2.2 Manholes

A. Materials and Details

All manholes shall be five feet in diameter and per MAG Standard Details and Specifications. Manhole frames and covers shall be Class 35 and their weights and dimensions shall be in accordance with details shown in MAG Standard Detail 424. Manholes constructed within the City will not contain built-in steps. The interior of all manholes shall be coated with Sewer Shield 100 or other approved corrosion resistant coating:

- 1. All manholes and rings shall be constructed of concrete as specified in the MAG Standards. Brick substitutes will not be permitted.
- 2. Reinforced concrete adjusting rings shall have a total height of no more than 18-inches.
- 3. Sewer manholes shall be tested per ASTM C-1244-93 as per the ARS R18-9-E301.D.3.f.ii.
- 4. If the manhole is more than 10-feet deep, or the line is over 12-inches in diameter, the manhole shall be 5-feet in diameter.
- 5. The flow channel through the manhole shall be steel-trowel finished to conform in shape and slope to that of the sewers.

^{*} Subject to regional variations as approved by the City's General Plan.

The manhole shelf shall be brush or broom finished, with a slope of 1-inch per foot. The manhole bottom should be filleted to prevent solid depositions and channeled to ensure satisfactory flow to the lower invert.

- 6. Manholes should be protected from storm drainage and flooding conditions whenever possible. Sewers will not be allowed in washes or drainage areas.
- 7. If designs specify manholes to be located in washes or drainage areas, bolted water-tight manhole covers or water-tight manhole inserts shall be used to prevent inflow. The manhole shall be a monolithically poured structure designed such that infiltration or exfiltration cannot occur. Providing for the elimination of infiltration and/or exfiltration in washes is the engineer's responsibility in the design of the system.

B. Spacing

- 1. Manholes are required at all changes in grade or pipe size, all changes in alignment, and to ensure the sewer line does not cross the street centerline. The horizontal angle formed between the two lines shall not be less than 90-degrees in the direction of flow.
- 2. Maximum manhole spacing shall be:
 - a. 400-feet for 8-inch to 15-inch sewer lines
 - b. 500-feet for all sewer lines 18-inchs or greater.
- 3. Manholes in City streets must be located near the center of a traffic lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, or crosswalks.
- 4. Cleanouts are not allowed in the City of Goodyear. If there are services between the last manhole and the end of the line, a manhole shall be required at the end of the line.
- 5. Manholes on boundaries of the subdivision or improvement district shall have stubs with shaped inverts in appropriate directions for future connections.
- 6. Centerline Station and offset shall be shown on all manholes.

7. A sewer manhole shall be required at the upstream end of a culde-sac. All manholes shall be located in such a manner as to provide easy access for the City's cleaning equipment.

C. Intersecting Lines Within Manholes

- 1. Manholes with lines intersecting at angles more than 30-degrees shall have a minimum 0.10-foot drop across the manhole.
- 2. When sewer lines of differing sizes enter the same manhole, the upstream pipe shall not have its crown lower than the crown of the downstream pipe.
- 3. In large trunk lines, invert at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.

D. Drop Manholes

If the difference in invert elevations between inflow and outflow sewers exceeds 12-inches, a drop connection shall be installed in accordance with MAG Standard Detail, No. 426 Type A. The manhole bottom shall be filleted to prevent solids deposition.

E. Monitoring Manholes

- 1. The City shall determine whether or not a sewer service will be required to have a monitoring manhole to test the flow and composition of their sewage. As a general rule, sewer users that have a projected water consumption of 25,000-gpd or a discharge of a categorical industrial nature or as otherwise required by the City's Water Resources Department, shall be required to have a monitoring manhole.
- 2. On sewer service lines with diameters smaller than 6-inches, monitoring manholes shall be constructed per MAG Standard Detail No. 420-1&2, and 421 with a straight channel and no taps or bends for 2 pipe lengths upstream and 1 pipe length downstream.
- 3. Design details for monitoring manholes on sewer service lines 6-inches or larger or with a peak flow greater than 40-gpm shall be approved by the City.
- 4. Monitoring manholes shall be located in a minimum 20-foot wide PUE which extends from a 20' radius around the manhole

to the existing public sewer. The monitoring manhole shall be accessible at all times for monitoring crews and vehicles.

F. Manholes Vector Spraying

All sewer manholes installed in the City limits shall be treated with an insecticide such as "Insecta" or approved equal.

- 1. The application of the insecticide shall be guaranteed for a length of 2-years from the initial application.
- 2. A record of the Insecticide applications and warranty information shall be provided to the City Water Resources Department and the necessary regulatory agencies.
- 3. The insecticide shall be applied to a depth of 12-feet with an average coverage of 140-sq. ft. per manhole. Sewer outlets and inlets to manholes shall also be treated.
- 4. The product and coating shall be applied per the manufacturer's label rate and EPA labels.
- 5. Each manhole that has been treated shall be marked with an identifying color or number as determined by the City Water Resources Department.
- 6. Only qualified and state licensed personnel shall be permitted to perform the work of applying the insecticide.

6.2.3 Taps

A. Materials and Details

All taps, whether into a line or into a manhole, will be performed by a licensed contractor at the expense of the developer. Prior to all taps, the contractor will contact the City's Construction Inspectors at 623-882-3110 and Water Resources, Wastewater Collection Division for inspection services at 623-982-3010 not less than 24-hours prior to tapping.

- 1. New sewer taps shall be per MAG Standard Details, No. 440 and 441.
- 2. The maximum number of taps into manholes shall be 3 into a manhole in a cul-de-sac and 2 into a manhole in all other situations. However, no tap is allowed into a manhole against incoming flow through the manhole. Sewer service line inverts

- shall be a maximum of 1.5-feet above the crown of the outflow pipe.
- 3. A 3-foot minimum separation between service taps is required.
- 4. All taps shall be dimensioned and stationed using the closest downstream manhole as Station 0 + 00. Typical dimensions to water service lines shall be shown.
- 5. Taps installed for future connection shall be marked.
- 6. All taps, when installed, must be perpendicular to the lateral. Taps may be at an angle only if located into a manhole, but the flow line of the sewer service line shall not be more than 4-inches below the crown of the line to be tapped.
- 7. No taps will be made directly into 12 inch or larger sewers. Such taps must be into an existing manhole or the developer shall install a new manhole at his expense.
- 8. Plans shall be reviewed by the design engineer for backflow prevention valves which are required where finish floor elevations are below both upstream and downstream manhole rim elevations.
- 9. Grease, oil, or sand interceptors which are acceptable to the City and approved by the Water Management Director shall be provided for laundries, restaurants, automobile service facilities, and other facilities when, in the opinion of the City, they are necessary for the proper handling of liquid wastes. Interceptors shall be supplied and maintained by the owner.
- 10. The owner will be responsible for the sewer service line from the main to the service facility.
- 11. Now sewer taps will be allowed between the sewer trunk and the odor control manhole.

B. Sizes

- 1. Tap sizes for single family residential developments shall be 4-inches. A 4-inch diameter tap shall be provided for each platted lot.
- 2. Commercial lots with buildings shall have 6-inch minimum taps and provide service adequate for discharge. Commercial

lots without buildings shall have <u>no</u> taps unless requested by owners, then only 6-inches or larger taps shall be allowed.

- 3. Multi-family developments shall have a minimum 6-inch tap.
- 4. All taps larger than 6-inch require the installation of a manhole.

C. Location

- 1. Taps shall be located so as to avoid conflicts with driveway locations.
- 2. Proposed tap locations shall be shown on all plans. Approval of all changes must be authorized by City Engineering Personnel.
- 3. Because water lines are located behind the curb in many locations, conflicts with sewer service lines are possible. Sewer lines should be designed to allow sewer service lines to pass under water mains behind the curb with a minimum 12-inches clearance to minimize potential health hazards.
- 4. When it is not possible to maintain sufficient clearance, or the sewer service will pass over the water main, the sewer service must be encased in concrete of 6-inches minimum thickness, 3-feet from each side of the crossing, or DIP must be used for the same distance.

D. Construction Details

All construction shall be per MAG Standard Details and Specifications to City of Goodyear modifications.

E. Televised Inspection

All newly installed sewers shall be inspected by closed circuit television methods acceptable to the City. Any defects discovered during televised inspection shall be corrected at no cost to the City. After correction of defects has been completed, affected sewer sections shall be re-televised, at no cost to the City. Video tapes or CDs of all televised inspections shall be provided to the City prior to final acceptance of the sewers.

6.3 Sewage Pump Stations

6.3.1 Site Selection

- A. In selecting a site for a sewage pumping facility, consideration should be given to:
 - 1. Accessibility
 - 2. Drainage Characteristics
 - 3. Visual Impact
 - 4. Function and Design Constraints
- B. The potential for flooding should be considered when selecting a pump station location. The station's equipment shall be protected from damage and remain operable during a 100-year flood event.

6.3.2 Pump Station Design

- A. Sewage pump station requirements are provided by ADEQ and are published in their Engineering Bulletin No. 11. Additional requirements specific to the City can be obtained from Water Resources Department before beginning design. At a minimum, telemetry, dual pumps, generator, 3-phase power, and odor control will be required.
- B. It is recommended that prior to the preparation of construction drawings that a preliminary or basis of design report be prepared and submitted to the City for acceptance. The preliminary report should outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer licensed in the State of Arizona must accompany all pump station design drawings.

6.3.3 Sewer Lift Station Design Standards

- A. There shall be a minimum of 2 pumps at each site. Pumps shall be capable of passing 2-1/2" solids and equipped with stainless steel motor shafts.
- B. Check valves shall be silent closing type and located in a separate vault.
- C. Three-phase 480-Volt power shall be used where available.
- D. Field prints shall include all electrical information.
- E. Phase protection shall be provided for all 3-phase motors and pumps.
- F. An hour meter shall be provided for each pump.

- G. Pump failure indicator lights shall be provided on the control panel and the exterior of the station.
- H. An access hatch and permanent ladder shall be installed in the wet well. The ladder shall be Type 304 stainless steel or greater.
- I. All pump station control panels shall be designed for future installation of a telemetry system.
- J. Only submersible pumps shall be used.
- K. Approved submersible pump stations shall be on the approved list at the Water Resources Department.
- L. A minimum of 3 sets of the operation and maintenance manuals shall be prepared and provided to the Water Resources Department prior to the final inspection.
- M. Force main shall be identified as such with magnetic marking tape 1-foot above the pipe.
- N. Clean outs shall be installed per section 6.3.D.4.
- O. Lift station shall be located a minimum distance of 100-feet from the nearest home. A block wall shall be constructed around the perimeter of the lift station site.
- P. Odor control measures must be identified in the design concept report and incorporation into the design.
- Q. The interior of all lift stations shall be coated with Sewer Shield 100 or other approved corrosion resistant coating
- R. Provide spare parts as recommended by the manufacturers.
- S. Electrical specifications information is to be provided on field prints as follows:
 - 1. Electrical specifications
 - 2. Size and type of conduits
 - 3. Size and type of over-current protection for all disconnects
 - 4. Phase protection for all 3-phase motors and pumps
 - 5. Floats shall be used for all controls and alarms.

- 6. Failure indicator lights on control panel
- 7. Hour meter totalizer for each pump
- 8. Flashing light to warn of pump failure
- 9. Alarm circuitry to one terminal board for telemetry
- 10. No electrical connections in wet well
- 11. NOTE: It is recommended that designers coordinate their pump station design with the City's Water Resources Department prior to final plan preparation.

6.3.4 Force Mains

A. Velocity Requirements

The velocity of flow in the force main shall be between 4-fps and 6-fps.

B. Materials of Construction

- 1. All types of pipe materials used in design of force mains shall be DIP with a ceramic epoxy lining. The DIP and epoxy lining shall meet established ASTM, ANSI, AWWA, and NSF standards of manufacture or seals of approval and shall be designated as pressure sewer pipe.
- 2. The epoxy lining shall be Protecto 401 or approved equal.
- 3. All cut ends or damaged epoxy sealed DIP shall be repaired or sealed per the epoxy's manufacturer's requirements.
- 4. Force mains shall be identified as such with magnetic marking tape 1-foot above the pipe.

C. Air Release Valves

Approved air release valves designed for sewage shall be provided on force mains at all peaks in elevation. See City Standard Details for air release valve requirements and the Approved Materials List approved models.

D. Cleanouts and Manholes

1. Two-way cleanouts shall be provided every 800-feet or 1-way cleanouts every 400-feet. (See City Standard Details)

2. For details regarding force main discharge into a manhole, refer to City Standard Details.

E. Water Line Separation

- 1. Where a force main crosses a water main or transmission line, the force main shall be constructed of DIP for a distance of 10-feet on each side of the water line.
- 2. For details regarding force main discharge into a manhole, refer to City Standard Details.
- 3. The minimum separation between force mains and water lines shall be 2-feet wall-to-wall vertically and 6-feet horizontally.

F. Testing

- 1. Prior to issuance of a Certificate to Operate, all force mains shall be pressure tested. Preparatory to testing, the section of the pipeline to be tested shall be filled with water and placed under a slight pressure for at least 48-hours. The pipeline shall than be brought up to 50-psi over or to 125-percent of working class pressure, whichever is greater, and shall be maintained on the section under test for a period of not less than 4-hours.
- 2. Accurate means shall be provided for measuring quantity of water required to maintain full test pressure on the line for the test period, which shall not exceed:

$$L = [JD \sqrt{(Pt)}]/4500$$

Where:

- a. L = Maximum allowable leakage in gallons per hour for the section of pipeline tested
- b. J = number of joints in length tested
- c. D = diameter of pipe in inches
- d. Pt = test pressure in psi

6.4 Wastewater Treatment

6.4.1 Treatment Plants

The subject of wastewater treatment plant design is beyond the scope of this design manual. The engineer shall contact the Maricopa County Environmental Services Department, and the City of Goodyear Water Resources Department for further information pertaining to the development of wastewater treatment facilities within the City.

6.4.2 Septic Systems

- A. When sewer service is not available, a temporary septic system may be allowed with the approval of both the City and the Maricopa County Environmental Services Department.
- B. A "dry" sewer line shall be installed along the entire length of the property line frontage. The property line frontage is that portion of the property along a public right-of-way. If a parcel to be developed has more than one property line frontage, the City will require a sewer line to be installed along all frontages.
- C. The operation and maintenance of septic systems are the responsibility of the owner. The City will not accept any septic system for operation and maintenance.

6.4.3 Reclaimed Water

Wastewater Reclamation and Advanced Treatment

The City's current <u>Wastewater Master Plan</u> calls for the development of regional wastewater reclamation facilities. Reclaimed water is to be used to satisfy the demand for water to irrigate golf courses and parks. Reclaimed water in excess of the irrigation demand shall be treat and stored underground for subsequent recovery. Contact the City's Water Resources Department for more detailed information on this plan.

6.5 Plan Preparation

6.5.1 General

- A. Plans shall be prepared per the guidelines in Chapter 2 of this manual Construction Plan Requirements.
- B. Notes which apply to construction on the City of Goodyear's sewer system are required on each set of improvement plans which include work on the City's sewer system or a sewer system which is to be dedicated to the City. These notes are provided in Section 2.1 of this manual.

6.5.2 Plan Requirements

The following paragraphs highlight improvement plan requirements pertaining to the preparation of sewer improvement plans which are to be submitted to the City for approval.

- A. Sewer line stationing shall be along the center line of the pipe.
- B. Concrete encasement shall be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
- C. If a line is to be connected to an existing system, the following note shall be placed on the plans: "Contractor shall verify the location of the existing sewer line before proceeding with trenching."
- D. Both slope and elevation shall be shown on all proposed sewer main stubs (profile not required).
- E. Where sewer lines cross water lines, storm drains, or drainage culverts, the relationship shall be shown in both plan and profile and minimum separations shall be called out.
- F. For permitting purposes, quantities for all items of work within public rights-of-way and public easements shall be included on the cover sheet of the plans.
- G. Sewer service line invert elevations shall be called out for all plans showing sewer service line construction.
- H. The drawings shall show all utility locations, sizes, easements, rights-of-way, and other structural features of the sewer for current and future building construction.
- I. Lift station details shall show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of wet wells and dry wells, valves and piping, surge control devices, pump suction, discharge details, and any other details which will provide a clear understanding of the design.
- J. Plans and profiles of force mains shall show size, invert and grade elevations, materials of construction, utility location, and any other details which define the force main construction requirements.
- K. Private sewer lines shall be noted as such on plans. The responsibility for operation and maintenance should also be called out.
- L. Easements of record shall be noted and shown in plan view including docket and page numbers or recorder's number.

- M. All plan documents for sewers and/or wastewater treatment works shall be prepared by a registered professional engineer licensed in the State of Arizona under the provisions of ARS 32:141-145.
- N. There are additional requirements for the preparation of improvement plans in the City. The additional requirements are presented in Section 2.1 of this manual.

6.5.3 Design Reports

- A. A design report shall be required. The design report serves to present necessary information concerning design assumptions and computations.
- B. The objective of the report is to provide background information for review of the project. All proposed lift station designs shall be accompanied by a signed and sealed design report.

C. Record Drawings

Record drawings are required for all sewer system improvements. Upon approval of the improvement plans, the Developer shall provide the City with As-Builts.

6.5.4 Reviews and Approvals

- A. All improvement plans which include work within the City shall be submitted for review and approval by City Staff. Plan review submittals are made to the Community Development Department. Plan review fees must be paid at the time of plan submittal.
- B. Maricopa County Environmental Services Department approval is required prior to City approval.
- C. No permits for public sewer installation will be issued until the Owner/Developer has provided the necessary easements and rights-of-way. The instruments of dedication must be approved by the City and recorded at the Maricopa County Recorder's Office.

6.5.5 Master Plans

A. When required, a Master Wastewater Plan and report shall be prepared in accordance with these Design Standards by a registered professional engineer who is licensed to practice in the State of Arizona. The master plan and report shall address, but not be limited to, the following:

- 1. The Master Plan will become the basis for a Water and Wastewater Service Agreement between the Developer and the City of Goodyear when such agreement is required by the City. This agreement will specify terms and requirements for water and wastewater service to the development. The introduction to the report should include this statement.
- 2. All development projects shall be responsible for determining their specific wastewater system needs. Service for proposed developments shall not be provided at the expense of existing customers and the wastewater master plans shall verify this.
- 3. Adequate sewer capacity must be shown for the development. In addition, sewer system calculations or a sewer model shall be used to determine the required on-site and off-site facilities such as sewer lines, lift stations, and force mains necessary to serve the project.
 - a. If no change in zoning is proposed, then the wastewater system for the project must be analyzed to the point of discharge to an existing sewer which has sufficient capacity to serve the project and which is included in the current City Wastewater Master Plan.
 - b. If the proposed development requires a change in zoning which increases density or proposes a sewer different from the City's existing Wastewater Master Plan, then the report will need to show calculations verifying that the existing or proposed sewer lines will be able to handle the additional flows.
 - c. Calculations should be based on Manning's equations using a Manning's "n" of 0.013 and the invert elevation and pipe diameters of all existing and proposed pipes.
 - d. Waste water flows generated within the development shall be calculated as specified in Section 6.2.A.10 Design Flows.
 - e. Off-site calculations shall be based on a sewer sub-basin which shall be shown on an accompanying map. The sub-basin shall include all areas upstream of the development and downstream of the development to the next interceptor sewer. An interceptor sewer shall be defined as 15-inch diameter or larger.

- f. Off-site wastewater flows shall be as specified in the City's current <u>Wastewater Master Plan.</u>
- g. A computer disk containing all calculations shall be submitted along with the master plan report. Common spread sheet formats compatible with Microsoft Excel are acceptable.
- B. Compliance with the current City <u>Wastewater Master Plan</u> for the respective area.
 - 1. Each Master Plan must include a map showing the following:
 - a. All proposed on-site and off-site facilities; including, but not limited to, interceptors, sewer lift stations, and force mains.
 - b. Proposed street locations, parcel boundaries, and proposed lots within each parcel.
 - c. Contour lines at 2-foot intervals showing the elevation of the land surface. If drainage requirements will require extensive grading, then finish grade should be shown. Sufficient information must be provided to evaluate pipe cover.
 - d. A separate area location map shall be provided showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of not less than 1mile from the exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.
 - e. The scale of all maps must be sufficient to show all required information clearly
 - 2. All sewer lines which cross golf courses or other open areas shall do so within established roads. If dedicated roads are not practical, then crossing must be within an easement 20-foot wide, or at the discretion of the Water Management Director, or his designee. All other sewer lines outside dedicated rights-of-way shall be on easements not less than 20-feet wide, or at the discretion of the Water Management Director, or his designee. No walls shall cross these easements.
 - 3. The Wastewater Master Plans must show compliance with the Goodyear Code of Ordinances to construct pipelines, if not

- already in place, across all dedicated frontages of the development. If the slope of the existing ground is such that other properties fronting the sewer would benefit, then this condition shall be justified in the report.
- 4. A construction schedule shall be included in table format for all wastewater related construction required to serve the development, per signed zoning or other agreements.